6.0 Anti-Degradation Analysis

This Anti-degradation Analysis (ADA) presents a quantitative estimate of pre-Project available receiving water assimilative capacity provided by Orchard Creek, and the incremental change in assimilative capacity utilization which could be expected from implementation of the proposed Project. Terms, methods, and applicable water quality criteria used in the ADA are defined and listed in Section 6.1. Baseline data are presented in Section 6.2, and the quantitative assessment of assimilative capacity utilization is presented in Section 6.3.

6.1 Definitions, Methods, and Criteria

6.1.1 Discharge and Receiving Water Flow Rates

The current effluent discharge flow is assumed to be the permitted capacity of the WWTP, 243 gallons per minute (0.35 mgd). The proposed future (expanded) effluent discharge rate is assumed to be 607 gallons per minute (0.875 mgd), the proposed Peak Daily (design) flow for the proposed facility.

For purposes of evaluating the use of assimilative capacity in the Anti-Degradation Analysis, receiving water stream flow rates must be determined or estimated. It is appropriate to use specific, statistically derived receiving water flow values for each constituent, according to the nature of the potential impact of that constituent. Stream flow data sufficient to calculate the appropriate flow parameters in the customary fashion are not available for Orchard Creek as of the date of this RWD.

The accepted critical low flow (short-term) values (appropriate for evaluating constituents with aquatic life impacts and acute human health impacts) are the 1Q10 and the 7Q10 for the portion of the year for which discharge is to be allowed (year-round in the case of Thunder valley). The accepted long-term flow value (appropriate for the evaluation of constituents with long-term human health impacts, mass-based impacts, and other long-term impacts) is the harmonic mean flow for the portion of the year for which discharge is to be allowed. The Anti-Degradation Analysis presented in this RWD uses a preliminary assumed value of 600 gpm as the critical low flow estimate for the receiving water of Orchard Creek upstream from the TVWWTP outfall. The value of 600 gpm is used instead of the 1Q10 or 7Q10 values because sufficient data to calculate 1Q10 and 7Q10 by customary methods are not available. The ADA uses a preliminary assumed value of 1,300 gpm as the harmonic mean flow for the receiving water of Orchard Creek upstream from the TVWWTP outfall, because sufficient data to calculate the harmonic mean flow are likewise not available.

The development of the preliminary assumed values of the seasonal low flow and the year-round harmonic mean flow in Orchard Creek are discussed in Section 4.2, Hydrology.

6.1.2 Representative Water Quality Data

This section explains the conventions for selecting representative water quality measurements – measurements which are appropriate representations of each parameter, considering the nature of each parameter's potential for impacts to beneficial uses. The data set summary is presented in Section 6.2. The full data set is included as Appendix A. Effluent quality expected from the proposed expanded facility is assumed to be identical to current effluent quality.

Discharges are regulated on the basis of total metals measurements. Analytical laboratory measurements for CTR metals are reported as total recoverable metal. Accordingly, all water quality characterization data and all water quality compliance criteria for CTR metals are discussed in terms of total recoverable metals in this ADA, unless noted otherwise.

6.1.2.1 Acute (Short-Term) Criteria

Representative water quality measurements for criteria based on short-term exposure are described in this section.

If the Water Quality Criterion (WQC) is established with the goal of protecting aquatic life, then the appropriate representative water quality measurement is the maximum measured concentration. The aquatic life criteria are based on one-hour exposure events (acute criteria) or on four-day exposure events (chronic criteria).

6.1.2.2 Chronic (Long-Term) Criteria

Representative water quality measurements for criteria based on long-term exposure are described in this section.

If the WQC is established with the goal of protecting agricultural uses or preventing human cancer, then the appropriate representative water quality measurement is the average of all measured concentrations. The human health criteria for carcinogenicity and the agronomic criteria are based on long-term exposure events measured in years.

If the constituent is bio-accumulative, persistent, or oxygen-depleting, then the appropriate representative water quality measurement is the average of all measured concentrations.

6.1.2.3 Treatment of ND Analytical Results

ND results are included in the calculation of the average of all measured concentrations, using one half of the Reporting Limit; for this reason, it is possible that the arithmetic mean of the results for a constituent may fall outside the range between the reported minimum and maximum concentrations. For determination of minimum and maximum concentrations for a given constituent, estimated (J-flagged) results are considered at the full value of the estimated concentration; for this reason, the minimum concentration reported for some constituents may be below the Reporting Limit specified by the analytical laboratory. Where 80% or more of the sample population is reported as ND, that constituent is considered to hold no potential to degrade water quality, because the constituent appears too infrequently in the water to create a significant effect on the long term, chronic water quality condition.

6.1.3 Assimilative Capacity

This section describes how the baseline and incremental change in assimilative capacity is quantified.

6.1.3.1 Existing Assimilative Capacity

APU 90-004 defines baseline water quality as "the most recent water quality resulting from permitted action". In general, the concept of assimilative capacity of a water body for a particular constituent is the difference between baseline and the appropriate water quality criterion for that constituent.

If the Basin Plan objective for a constituent is "Non-Detect", then the existing assimilative capacity for that constituent is zero.

If Basin Plan, CTR, or other applicable water quality action sets a numerical water quality objective or goal for a constituent, then the existing assimilative capacity for that constituent is calculated as discussed in Section 6.1.3.2 for concentration-based limits, or Section 6.1.3.3 for mass-based limits.

If a receiving water exceeds a WQC for a water quality parameter, then it is not "high quality" water with respect to that parameter. For constituents found to be present in the upstream receiving water at levels representing excursions beyond existing water quality criteria, the water is classified as Tier 1 under Federal anti-degradation law. As explained in a 1987 memo from SWRCB Chief Counsel William Atwater to the Regional Board Executive Officers (SWRCB, 1987), Tier 1 waters do not require a balancing of the Project's benefits and the public interest of the State, under California law. Non-attainment analysis of Orchard Creek is presented in Section 6.2.2.

6.1.3.2 Incremental Use of Assimilative Capacity – Concentration-Based

The existing concentration loading assimilative capacity for a constituent (in units of mass per unit volume) is calculated as the flow-weighted downstream concentration of that constituent with TVWWTP discharge equal to 0.35 mgd, subtracted from the governing water quality criterion.

Existing (pre-Project) Assimilative Capacity (units of concentration):

$$(Governing\ WQC) - \frac{\left(Q_{rec\ water} * C_{rec\ water} + Q_{0.350\ mgd} * C_{WWTP\ Effluent}\right)}{\left(Q_{rec\ water} + Q_{0.350\ mgd}\right)}$$

Q = a discharge rate
C = a constituent concentration
rec water = receiving water

The downstream concentration of a constituent with the proposed Project in place (TVWWTP discharge equal to 0.875 mgd) is calculated as:

$$\frac{\left(Q_{rec\ water} * C_{rec\ water} + Q_{0.875\ mgd} * C_{WWTP\ Effluent}\right)}{\left(Q_{rec\ water} + Q_{0.875\ mgd}\right)}$$

In terms of concentration units, the incremental change in available assimilative capacity is assessed by calculating, for each constituent, the difference between the flow-weighted downstream concentrations calculated above for the two TVWWTP discharge rates. To calculate the percentage of available assimilative capacity used (or created) by the Project, the incremental change in available assimilative capacity is divided by the Existing (pre-Project) Assimilative Capacity as calculated above.

6.1.3.3 Incremental Use of Assimilative Capacity – Mass-Based

The potential post-project mass loading assimilative capacity for a constituent (in units of mass per unit time) is calculated as the product of the proposed future total flow at R2 (receiving water flow plus proposed future Project flow) multiplied by the governing water quality criterion for that constituent. The product is reduced by existing mass contributions from the existing permitted discharge and the existing receiving water flow, to arrive at the existing mass loading assimilative capacity for that constituent. The calculation is shown below:

Existing (pre-Project) Assimilative Capacity (units of mass discharge rate):

$$(Governing\ WQC) * \left(Q_{rec\ water} + Q_{0.875\ mgd}\right) - \left(Q_{rec\ water} * C_{rec\ water}\right) - \left(Q_{0.350\ mgd} * C_{WWTP\ Effluent}\right)$$

The incremental use of assimilative capacity for constituents with mass-based impacts, expressed as a mass discharge rate, is assessed by calculating the change in loading as the difference between the current mass loading rate and the future mass loading rate including the proposed Project. To express the incremental use of assimilative capacity as a percentage of the existing (pre-Project) assimilative capacity, this incremental change in loading rate is divided the existing assimilative capacity. The calculations are shown below.

The incremental change in use of assimilative capacity (in units of mass discharge rate):

$$\left(Q_{0.875\ mgd} * C_{WWTP\ Effluent}\right) - \left(Q_{0.350\ mgd} * C_{WWTP\ Effluent}\right)$$

The incremental change in use of assimilative capacity (as a fraction of pre-Project existing capacity):

$$\frac{\left(Q_{0.875\ mgd} * C_{WWTP\ Effluent}\right) - \left(Q_{0.350\ mgd} * C_{WWTP\ Effluent}\right)}{\left(Governing\ WQC\right) * \left(Q_{rec\ water} + Q_{0.875\ mgd}\right) - \left(Q_{rec\ water} * C_{rec\ water}\right) - \left(Q_{0.350\ mgd} * C_{WWTP\ Effluent}\right)}$$

6.1.4 Applicable Water Quality Criteria

The ADA was performed for every constituent for which at least one concentration, either estimated (below the Reporting Limit) or confirmable (above the Reporting Limit), was reported in the data set defined in Section 6.2.1. **Table 6-1** below lists the lowest applicable water quality criterion for each parameter in the ADA, along with the basis for the WQC.

Table 6-1 Water Quality Criteria

PARAMETER	MOST SENSITIVE BENEFICIAL USE	MOST STRINGENT WQC	BASIS
General Minerals [mg/L or as noted]			
pH [SU]	Aquatic life	6.5 < pH < 8.5	BP
Temperature [deg F]	Aquatic life	< 5 deg increase	BP
Alkalinity (as CaCO3)	~	none	~
Hardness, total (as CaCO3)	~	none	~
Bicarbonate (as CaCO3)	~	none	~
Total Dissolved Solids (TDS)	Agricultural use	450	BP
Specific conductance (EC) [umho/cm]	Agricultural use	700	BP

Table 6-1 Water Quality Criteria

PARAMETER	MOST SENSITIVE BENEFICIAL USE	MOST STRINGENT WQC	BASIS
Ammonia (as N) (3)	Aquatic life	0.42	EPA 822-R-99-014
Nitrate (as NO_3)	Human health	45	CA DHS MCL
Nitrite (as N)	Human health	1	CA DHS MCL
Phosphorus, Total (as P)	~	none	~
Chloride	Agricultural use	250	CA DHS 2ndary MCL
Sulfate (as SO_4)	~	250	CA DHS 2ndary MCL
Sulfide (total)	~	no criteria	~
Sulfite	~	no criteria	~
Foaming Agents (MBAS)	Human health	0.5	CA DHS 2ndary MCL; BP
Biochemical Oxygen Demand (BOD)	Aquatic life	narrative	EPA 440/9-76-023; BP
Inorganics [ug/L or as noted]			
Aluminum	Aquatic life	87	EPA 440/5-86-008
Barium	Human health	1000	CA DHS MCL
Boron	Agricultural use	750	EPA 440/5-86-001
Fluoride	Agricultural use	1000	Pettygrove, 1984
Iron	Human health	300	CA DHS 2ndary MCL
Manganese	Human health	50	CA DHS 2ndary MCL
Priority Pollutants [ug/L or as noted]			
Antimony	Human health	6	CA DHS MCL
Arsenic	Human health	10	Federal MCL
Cadmium	Aquatic life	1.5	CTR-AQ-CCC (1)
Chromium (total)	Aquatic life	120	CTR-AQ-CCC (2)
Chromium (hexavalent)	Aquatic life	11.4	CTR-AQ-CCC
Copper	Aquatic life	5.3	CTR-AQ-CCC (1)
Lead	Aquatic life	1.4	CTR-AQ-CCC (1)
Mercury [ng/L]	Human health	50 (dissolved)	CTR-HH
Nickel	Aquatic life	30	CTR-AQ-CCC (1)
Selenium	Aquatic life	5	CTR-AQ-CCC
Thallium	Human health	1.7	CTR-HH
Zinc	Aquatic life	69	CTR-AQ-CMC (1)

Table 6-1 Water Quality Criteria

PARAMETER	MOST SENSITIVE BENEFICIAL USE	MOST STRINGENT WQC	BASIS
Chloroform	Human health	80	CA DHS MCL
Di-n-butylphthalate	Human health	2,700	CTR-HH
Fluorene	Human health	1,300	CTR-HH
Phenanthrene	~	no criteria	~
Beta Hexachlorocyclohexane (BHC)	Aquatic life	0	BP
Endrin Aldehyde	Aquatic life	0	BP

NOTES

(1) CTR Hardness-dependent criteria were calculated using the minimum recorded hardness value of the upstream receiving water (52 mg/L as $CaCO_3$), and are expressed in this table as total recoverable metal.

(2) The criterion of 120 ug/L is the CTR hardness-adjusted criterion for total recoverable trivalent chromium, calculated using water hardness of 52 mg/L as $CaCO_3$.

(3) Calculation of the criterion for total ammonia was based on the highest effluent pH of 8.3 (Table 6-10) and the highest effluent temperature of 34.4°C recorded during the term of the current NPDES permit. The lowest applicable CCC water quality criterion for total ammonia was calculated to be 0.42 mg N/L . The method is published in USEPA 822-R-02-047.

6.1.5 Significance

For constituents with concentration-based impacts, a significance threshold of 10% reduction of assimilative capacity was applied. The ten percent threshold was recommended by USEPA's Office of Water Technology in a 10 August 2005 memo titled "*Tier 2 Anti-Degradation Reviews and Significance Thresholds*", which includes the statement that a reduction of up to 10% of a receiving water body's assimilative capacity for a given constituent "...represents minimal risk to the receiving water and is fully consistent with the objectives and goals of the Clean Water Act."

6.2 Baseline Water Quality

This section presents the representative water quality measurements used in the ADA, and the bases for their derivation

6.2.1 Data Set

This ADA is based on WWTP operator records, on the analytical data presented to the Regional Board in the Report titled *Wastewater Characterization Technical Report, January 30, 2007* (January 2007 TR), and on two additional analytical reports for sampling events staged on 30 January 2007 and 10 July 2007. The list of water quality parameters assessed in the data set included all priority pollutants included on the California Toxics Rule (CTR) list and the National Toxics Rule (NTR) List, and also additional analytes specified by Regional Board staff in the Region Five 13267 letter dated 10 September 2001. The sampling program included a total of nine sampling events between June 2005 and July 2007. The data set is representative of recent plant performance. The full data set is included in tabular format in **Appendix A.**

Operator records for 2005, 2006, and 2007 (through June 2007) were used to compile summary statistics for four water quality parameters which are monitored on-site: dissolved oxygen (receiving water), pH (effluent and receiving water), temperature (receiving water), and turbidity (effluent and receiving water). The summaries are included in **Section 6.2.2** (dissolved oxygen) and in **Section 6.3** (pH, temperature, and turbidity).

Table 6-2 below includes all water quality parameters which either were quantified at concentrations above their respective Reporting Levels (RLs), or were reported as estimated concentrations below their respective RLs. Water quality parameters which were never detected and never estimated in any of the nine sampling events were not considered further in this ADA. Water quality parameters for which no water quality compliance criteria have been established were likewise not considered further.

Table 6-2 ADA Data Set Summary

	EFFLUENT			RECEIVING WATER			REPRESENTATIVE WQ MEASUREMENT			
	# SAMPLES ANALYZED	# DETECTIONS ABOVE RL	DECTION FREQUENCY ABOVE RL	# SAMPLES ANALYZED	# DETECTIONS ABOVE RL	DECTION FREQUENCY ABOVE RL	TYPE	EFFLUENT	RECEIVING WATER	WQC (1)
General Minerals [mg/L or as noted]										
pH [SU]	908	908	100%	128	128	100%	MAX / MIN	6.4 / 8.3	6.4 / 8.2	6.5 < pH < 8.5
Temperature [deg F]	6	6	100%	129	129	100%	Change in receiving water temp.			< 5 deg increase
Hardness, total (as $CaCO_3$)	7	7	100%	6	6	100%	MIN RW	24 (MIN)	52 (MIN)	none
Total Dissolved Solids (TDS)	9	9	100%	6	6	100%	AVG	228	106	450
Specific conductance (EC) [umho/cm]	6	6	100%	9	9	100%	AVG	403	191	700
Ammonia (as N) (3)	7	4	57%	6	3	50%	MAX	0.17	0.09	0.42
Nitrate (as N)	7	6	86%	6	2	33%	AVG	1.69	0.27	9.84
Nitrite (as N)	6	2	33%	6	1	17%	AVG	0.03	0.17	1

Table 6-2 ADA Data Set Summary										
	EFFLUENT			RECEIVING WATER			REPRESENTATIVE WQ MEASUREMENT			
	# SAMPLES ANALYZED	# DETECTIONS ABOVE RL	DECTION FREQUENCY ABOVE RL	# SAMPLES ANALYZED	# DETECTIONS ABOVE RL	DECTION FREQUENCY ABOVE RL	TYPE	EFFLUENT	RECEIVING WATER	WQC (1)
Phosphorus, Total (as P)	6	6	100%	5	2	40%	AVG	2.7	0.05	none
Chloride	6	6	100%	6	6	100%	AVG	58	8	250
Sulfate (as SO_4)	7	7	100%	6	6	100%	AVG	17	6	250
Sulfide (total)	6	1	17%	6	2	33%	AVG	1.1	0.9	none
Sulfite	5	2	40%	6	1	17%	AVG	1.3	2.0	none
Foaming Agents (MBAS)	7	3	43%	6	2	33%	AVG	0.051	0.046	0.5
Inorganics [ug/L or as noted]										
Aluminum	7	1	14%	7	6	86%	MAX	71	890	87
Barium	5	0	0%	5	1	20%	AVG	5.5	84	1,000
Boron	2	0	0%	2	1	50%	AVG	20	32	750
Fluoride	7	2	29%	6	0	0%	AVG	113	86	1,000
Iron	5	0	0%	5	5	100%	AVG	50	488	300
Manganese	5	0	0%	5	2	40%	AVG	6.6	60	50
Priority Pollutants [ug/L or as noted]										
Antimony	7	0	0%	7	0	0%	AVG	1.9	2.1	6
Arsenic	7	2	29%	7	2	29%	AVG	0.8	1.1	10
Cadmium	7	0	0%	7	0	0%	MAX	0.24 J	<0.25	1.5
Chromium (total)	7	0	0%	7	0	0%	MAX	0.93 J	1.4 J	120 (2)
Chromium (hexavalent)	7	0	0%	7	0	0%	MAX	< 1.0	< 1.0	11.4
Copper (4)	7	7	100%	7	7	100%	MAX	16	3.6	5.3
Lead	7	5	71%	7	2	29%	MAX	1.1	0.94	1.4
Mercury [ng/L]	7	6	86%	7	7	100%	AVG	0.9	4.0	50 (dissolved)
Nickel	7	1	14%	7	1	14%	MAX	3.2 J	5.9	30
Selenium	7	0	0%	7	0	0%	MAX	3.1 J	4.7 J	5
Thallium	7	0	0%	7	0	0%	AVG	0.45	< 1	1.7
Zinc (5)	5	5	100%	5	0	0%	AVG	51.9	5.27	69
Chloroform	5	0	0%	5	0	0%	AVG	0.3	< 0.50	80
Di-n-butylphthalate	7	0	0%	7	0	0%	AVG	< 10	4.59	2,700

Table 6-2 ADA Data Set Summary

	EFFLUENT			RECEIVING WATER			REPRESENTATIVE WQ MEASUREMENT			
	# SAMPLES ANALYZED	# DETECTIONS ABOVE RL	DECTION FREQUENCY ABOVE RL	# SAMPLES ANALYZED	# DETECTIONS ABOVE RL	DECTION FREQUENCY ABOVE RL	TYPE	EFFLUENT	RECEIVING WATER	WQC (1)
Fluorene	7	0	0%	7	0	0%	AVG	0.11	< 0.20	1,300
Phenanthrene	7	1	14%	7	0	0%	AVG	0.12	0.09	no criteria
Beta Hexachlorocyclohexane (BHC)	8	0	0%	7	1	14%	MAX	< 0.005	0.12	0
Endrin Aldehyde	8	1	13%	7	0	0%	MAX	0.014	< 2	0
Dioxin and Furans [picograms/L]										
OCDD [pg/L]	2	0	0%	2	0	0%	AVG	0.000	13.9 J	no criteria

NOTES

Metals criteria are expressed as total unless otherwise noted.

Results expressed as "< " were never detected or quantified in any sample; the number is the highest Reporting Limit.

J The result is an estimated concentration below the method Reporting Limit.

(1) The bases of the WQCs are given in Table 6-1. CTR Hardness-dependent criteria were calculated using a hardness value of 52 mg/L as $CaCO_3$.

(2) The criterion of 120 ug/L is the CTR hardness-based criterion for total recoverable trivalent chromium calculated using water hardness of 52 mg/L as $CaCO_3$.

(3) Based on the highest effluent pH of 8.3 and the highest effluent temperature of 34.4°C, the lowest applicable water quality criterion for total ammonia is 0.42 mg N/L. It should be noted that the two maxima did not occur simultaneously, nor is there any pattern of effluent pH being elevated when effluent temperature is elevated.

(4) Maximum effluent concentration exceeds the criterion, but a WER study has been completed which is expected to remove Reasonable Potential for copper from the discharge assessment.

(5) Maximum effluent concentration exceeds the criterion, which will be prevented by WQBELs, therefore this ADA used average values to assess assimilative capacity utilization.

6.2.2 Non-Attainment Water Quality Parameters

When existing baseline water quality in the receiving water exceeds applicable water quality objectives (is "high quality" water), the anti-degradation policy of the State of California requires that any lessening of the quality of the receiving water must be outweighed by economic and/or social benefits of the activity leading to the water quality impact.

When existing baseline water quality in the receiving water represents an excursion beyond applicable water quality objectives for a particular constituent (is not "high quality" water with respect to that constituent), the water body is considered to have no assimilative capacity for additional loading of that constituent. In such a case, the ADA does not need to provide the balancing analysis of the proposed action and the public interest of the State, which is described in Section 6.1.3.1 above. The mechanism by which existing beneficial uses are protected in such a case is the adoption of effluent limitations in discharge permits issued by the local Regional Water Quality Control Boards.

The performance standard for a proposed discharge to receiving water that does not meet the regulatory standard for "high quality" water is the maintenance and protection of existing uses of the receiving water. The standard is achieved through compliance with effluent limitations for the constituent in question. For such constituents, the ADA is not carried further, because the question of use of existing assimilative capacity is essentially moot. The water body is considered to offer no additional assimilative capacity, and the question of the need for effluent limitations hinges on effluent analysis: when the receiving water body exceeds a criterion and the constituent has been detected at *any* level in the effluent, then effluent limitations are required. However, if the constituent has never detected in the WWTP effluent, generally only monitoring requirements are imposed.

For the purposes of this ADA, the analytical laboratory data indicate that Orchard Creek is not "high quality" with respect to **aluminum**, **iron**, and **manganese** because the maximum receiving water concentration of each constituent exceeded the applicable WQC. As shown in **Table 6-2** above, the average upstream receiving water concentrations of iron and manganese currently exceed their respective water quality criteria; the average receiving water aluminum concentration (369 ug/L, based on six reported concentrations and one estimated concentration) also exceeds the applicable WQC shown in Table 6-2. As shown in **Tables 6-5 and 6-6** below, the WWTP effluent concentrations of aluminum, iron, and manganese are typically low enough to expect a measurable improvement (a decrease in concentration of in-stream aluminum, iron, and manganese) in Orchard Creek downstream from the outfall under low flow conditions, if the proposed Project is implemented.

For the purposes of this ADA, the analytical laboratory data indicate that Orchard Creek is not "high quality" with respect to **beta Hexachlorocyclohexane (Beta-BHC)** (CTR #104). Beta BHC was reported as present in one out of seven samples in the receiving water of Orchard Creek (Table 6-2). The Basin Plan includes a non-detect water quality criterion for persistent chlorinated hydrocarbon pesticides. Beta-BHC was not detected or estimated in any of eight WWTP effluent samples analyzed.

Orchard Creek upstream from the discharge does not meet Basin Plan dissolved oxygen objectives for water bodies outside of the Delta, which are: the monthly median of the mean daily dissolved oxygen concentration shall not fall below 85 percent of saturation in the main water mass, and the 95th percentile concentration shall not fall below 75 percent of saturation. Of 129 paired sampling events, dissolved oxygen at R2 was greater than at R1 for 64% of the events, and dissolved oxygen at the two sampling points was equal for an additional 14% of the sampling events. Dissolved oxygen was greater at R1 compared to R2 in only 29 out of 129 instances (22%). The percentage of saturation was also consistently higher at R2 relative to R1. **Table 6-3** below summarizes 129 paired monitoring events for receiving water dissolved oxygen at R1 and R2 conducted between January 2005 and June 2007. The average percent of saturation with respect to dissolved oxygen in Orchard Creek was 76% at R1 and 78% at R2; the median percent of saturation with respect to dissolved oxygen in Orchard Creek was 76% at R1 and 80% at R2. Because the upstream (R1) receiving water dissolved oxygen percent saturation does not meet the Basin Plan standard of 85 percent of saturation in the main water mass as the running monthly median, Orchard Creek above the TVWWTP outfall does not meet Basin plan standards and therefore is not "high quality" with respect to **dissolved oxygen.**

Table 6-3 Receiving Water Dissolved Oxygen Summary Statistics

	DISSOLVED OXYGEN CONCENTRATION		PERCENT SATURATION		RELATIVE PERCENT SATURATION	
	R1 D.O.	R2 D.O.	R1 %	R2 %	# DAYS R2% > R1%	# DAYS R1% > R2%
	[mg/L]	[mg/L]	[%]	[%]	[~]	[~]
n	129	129	129	129	92	37
Minimum	2.2	2.3	29	28	~	~
Mean	7.8	8.0	76	78	~	~
Median	7.7	7.8	76	80	~	~
Maximum	15.2	14.9	131	132	~	~

NOTES:

Receiving water dissolved oxygen data collected January 2005 – June 2007
R1 – Upstream from point of discharge
R2 – Downstream from point of discharge

Because the receiving water, absent the discharge, exceeds the applicable WQCs for aluminum, iron, manganese, beta-BHC, and dissolved oxygen, Orchard Creek does not meet the regulatory standard for "high quality" waters with respect to these parameters. The performance standard for the proposed Project in such a case is maintenance and protection of existing uses. The treatments and controls described in Section 6.4 of this ADA will be protective of existing uses. As provided in Resolution 68-16 and in the SIP, and in SWRCB, 1987 (see Section 6.1.3.1 above), because the receiving water of Orchard Creek provides no additional assimilative capacity for aluminum, iron, manganese, beta-BHC, and dissolved oxygen, these constituents will not be addressed further in this ADA.

6.2.3 Constituents Never Quantified Above Reporting Limit

Eight water quality constituents listed in Table 6-2 were never detected above their respective RLs; they were either reported as Not Detected or as an estimated concentration below the Reporting Limit for all samples analyzed. Analytical data, Reporting Limits, and applicable water quality criteria for these eight water quality constituents are summarized in **Table 6-4** below.

Because the RLs were equal to or less than their respective WQCs in every case, and all reported estimated concentrations were below applicable WQCs, the data demonstrate that these eight constituents pose no reasonable potential for concentration-based negative impacts. Selenium, which was never detected in the TVWWTP effluent above the RL/WQC of 5 ug/L, was assessed for mass-based negative impacts (Table 6-7) because of its bioaccumulative characteristics. The remaining seven constituents were not addressed further in this ADA, because there is no conclusive evidence that they are present in the TVWWTP effluent at levels which could impact beneficial uses.

Table 6-4 Constituents Never Quantified Above Reporting Limit

				WWTP EFFLUENT			RECEIVING WATER			
CONSTITUENT	UNITS	REPORTING LIMIT	WQC (1)	No. of SAMPLES	No. of NDs	MAXIMUM ESTIMATED VALUE	No. of SAMPLES	No. of NDs	MAXIMUM ESTIMATED VALUE	CURRENT EFFLUENT LIMITATION
Antimony	ug/L	5	6	7	5	1.0	7	5	2.6	N
Cadmium (2)	ug/L	0.25	1.5	7	6	0.25	7	7	none	N
Chromium – Total (2)	ug/L	2	120	7	1	0.93	7	1	1.4	N
Chromium – Hexavalent	ug/L	1	11.4	7	7	none	7	7	none	N
Selenium	ug/L	5	5	7	4	3.1	7	5	4.7	N
Thallium	ug/L	1	1.7 (3)	7	6	0.12	7	7	none	N
Chloroform	ug/L	0.5	80	8	6	0.49	7	7	none	Y
OCDD	pg/L	50	none	6	6	none	5	5	13.9	N

NOTES
(1) Metals criteria are expressed as total unless otherwise noted.
(2) CTR Hardness-dependent criteria were calculated using a hardness value of 52 mg/L as $CaCO_3$.
(3) Expressed as dissolved thallium.

6.3 Utilization Of Assimilative Capacity

For Tier 2 or Tier 3 waters (where applicable water quality criteria are not already exceeded, prior to any new or increased discharge) available assimilative capacity of a water body is the difference between the applicable water quality criterion for a particular constituent and the existing background water quality for that criterion, including permitted discharges. Where applicable water quality criteria are exceeded in the receiving water body absent the discharge, the question of baseline assimilative capacity is addressed in Section 6.2.2 above.

Section 6.3.1 presents summary results of the concentration-based quantification of existing assimilative capacity, and incremental use of assimilative capacity after implementation of the proposed project, for every constituent reported present in any effluent sample, or in any receiving water sample, at a concentration over the RL.

Section 6.3.2 presents summary results of the mass-based quantification of existing and incremental use of assimilative capacity for the subset of constituents from Section 6.3.1 which are believed to exhibit persistent or bioaccumulative and toxic effects in the downstream receiving water.

6.3.1 Constituents with Concentration-Based Impacts

Table 6-5 and **Table 6-6** below present summary ADA findings for every constituent reported present in any effluent sample, or in any receiving water sample, at a concentration over the RL. Tables 6-5 and 6-6 include three constituents which were never detected at concentrations at or above their respective Reporting Levels in the WWTP effluent: barium (RL = 100 ug/L), iron (RL = 100 ug/L), and manganese (RL = 20 ug/L). They are included in the quantitative analysis because each was detected at a concentration at or above the applicable Reporting Level in the receiving water of Orchard Creek.

The tables show the expected concentration in Orchard Creek downstream from the discharge outfall of each constituent, for two TVWWTP discharge rates, 243 gal/min (0.35 mgd, the currently permitted maximum daily treatment capacity) and 607 gal/min (0.875 mgd, the proposed Peak Day Flow). The tables also show the existing assimilative capacity and the portion of that existing capacity projected to be used by the expansion.

Table 6-5 addresses constituents currently regulated with effluent limitations in the existing NPDES permit; **Table 6-6** addresses constituents with no effluent limitations in the existing NPDES permit.

**Table 6-5 Concentration-Based Assimilative Capacity Utilization
Constituents With Effluent Limitations**

PARAMETER	UNITS	EFFLUENT DETECTION FREQUENCY ABOVE RL	PARAMETER CONCENTRATION AT R2			LOWEST APPLICABLE WQC	ASSIMILATIVE CAPACITY	
			CURRENT ADWF 0.350 MGD	PROPOSED PROJECT ADWF 0.875 MGD	INCREMENTAL CHANGE		AVAILABLE PRE-PROJECT	USED BY PROJECT
GENERAL MINERALS								
Specific conductance (EC) (5)	umho/cm	100%	224	258	**34**	700	476	7%
Ammonia (as N)	mg/L	57%	0.12	0.13	**0.02**	0.42	0.3	5%
Nitrate (as N) (5)	mg/L	86%	0.49	0.72	**0.23**	9.84	9.4	2%
Sulfate (as SO_4)	mg/L	100%	9.4	12	**2.2**	250	249	1%
Foaming Agents (MBAS)	mg/L	43%	0.048	0.049	**0.001**	0.5	0.45	0.2%
INORGANICS								
Aluminum	ug/L	14%	654	478	**-176**	87	0	(1)
Boron	ug/L	0%	29	26	**-3**	750	721	-0.4%
Fluoride	ug/L	29%	94	100	**6**	1,000	906	0.7%
PRIORITY POLLUTANTS								
Arsenic	ug/L	29%	1.04	0.96	**-0.08**	10	9	-0.9%
Copper (2)	ug/L	100%	7.17	9.84	**2.66**	5.3	0	(2)
Endrin Aldehyde	ug/L	13%	0.11	0.08	**-0.03**	0	0	(3)

NOTES

The receiving water flow rate is assumed to be equal to the estimated seasonal low flow rate during the discharge season (600 gpm for the period January-December), for all constituents unless otherwise noted.

An Incremental Change less than zero indicates that the increased discharge is expected to decrease the concentration of the constituent (increase the assimilative capacity) at the downstream monitoring point R2.

CTR hardness-dependent criteria were calculated using a hardness value of 52 mg/L as $CaCO_3$

The following constituent was never detected in the WWTP effluent at concentrations over the RL: Beta BHC

(1) The receiving water of Orchard Creek above the discharge currently exceeds the criterion, therefore the receiving water is not high quality with respect to this parameter.

(2) The maximum effluent concentration exceeds the criterion, but a WER study has been completed which is expected to allow removal of Reasonable Potential for copper from the discharge assessment and substantially increase available assimilative capacity .

(3) The Basin Plan sets the presumed assimilative capacity for this constituent to zero.

(4) The currently-applied WQCs for copper are expected to be revised in response to current research, and a substantially increased assessment of assimilative capacity is expected to result.

(5) Receiving water flow rate assumed to be equal to the estimated harmonic mean flow rate during the discharge season (1,300 gpm for the period January-December).

Table 6-6 Concentration-Based Assimilative Capacity Utilization
Constituents Without Effluent Limitations

PARAMETER	UNITS	EFFLUENT DETECTION FREQUENCY ABOVE RL	PARAMETER CONCENTRATION AT R2			LOWEST APPLICABLE WQC	ASSIMILATIVE CAPACITY	
			CURRENT ADWF 0.350 MGD	PROPOSED PROJECT ADWF 0.875 MGD	INCREMENTAL CHANGE		AVAILABLE PRE-PROJECT	USED BY PROJECT
GENERAL MINERALS								
Total Dissolved Solids (TDS) (2)	mg/L	100%	125	145	20	450	325	6%
Nitrite (as N) (2)	mg/L	33%	0.15	0.13	-0.02	1	0.85	-3%
Phosphorus, Total (as P) (2)	mg/L	100%	0.5	0.9	0.4	no criteria	~	~
Chloride	mg/L	100%	22	33	11	250	228	5%
Sulfide (total)	mg/L	17%	0.93	0.98	0.05	no criteria	~	~
Sulfite	mg/L	40%	1.8	1.7	-0.15	no criteria	~	~
INORGANICS								
Barium (2)	ug/L	0%	71	59	-13	1,000	929	-1%
Iron (2)	ug/L	0%	419	348	-71	300	0	(1)
Manganese (2)	ug/L	0%	52	43	-9	50	0	(1)
PRIORITY POLLUTANTS								
Lead	ug/L	71%	0.99	1.0	0.03	1.4	0.41	8%
Mercury (2)	ng/L	86%	3.55	3.04	-0.51	50	46	-1%
Nickel	ug/L	14%	5.12	4.54	-0.58	30	24.9	-2%
Zinc	ug/L	100%	19	29	10	69	50	20%
Phenanthrene	ug/L	14%	0.10	0.11	0.01	no criteria	~	~

NOTES

The receiving water flow rate is assumed to be equal to the estimated seasonal low flow rate during the discharge season (600 gpm for the period January-December), for all constituents unless otherwise noted.

An Incremental Change less than zero indicates that the increased discharge is expected to decrease the concentration of the constituent (increase the assimilative capacity) at the downstream monitoring point R2.

CTR hardness-dependent criteria were calculated using a hardness value of 52 mg/L as $CaCO_3$.

The following constituents were never detected in the WWTP effluent at concentrations over the RL:
Barium was never detected in the WWTP effluent above the RL of 100 ug/L
Iron was never detected in the WWTP effluent above the RL of 100 ug/L
Manganese was never detected in the WWTP effluent above the RL of 20 ug/L

(1) The receiving water of Orchard Creek above the discharge currently exceeds the criterion, therefore the receiving water is not high quality with respect to this parameter.

(2) Receiving water flow rate assumed to be equal to the estimated harmonic mean flow rate during the discharge season (1,300 gpm for the period January-December).

6.3.2 Constituents with Mass-Based Impacts

Conservative constituents with bioaccumulative potential were evaluated on a mass-loading basis, in addition to evaluation on a concentration-loading basis. Five conservative constituents with bioaccumulative potential were reported in the data set: Total dissolved solids, mercury (total), selenium, Endrin aldehyde, and beta Hexachlorocylclohexane (Beta-BHC). **Table 6-7** below presents summary ADA findings for potential mass discharge based impacts of these five conservative constituents.

For assessment of long-term impacts such as mass loading, the appropriate measurement of receiving water flow is the harmonic mean flow for the period of proposed discharge. Because TVWWTP discharges year round, the appropriate value to use in the mass loading ADA is the harmonic mean flow for the entire calendar year. The estimated year-round harmonic mean flow rate for Orchard Creek at the location of the TVWWTP outfall is estimated to be 1,300 gpm (1.8 mgd)(see Section 4.2). The current and proposed future TVWWTP discharge flow rates were assumed to be 243 gpm (0.35 mgd) and 607 gpm (0.875 mgd) respectively.

Table 6-7 Mass-Based Assimilative Capacity Utilization

PARAMETER	EFFLUENT DETECTION FREQUENCY ABOVE RL	MASS LOADING TO ORCHARD CREEK FROM PROJECT [kg/day]			ASSIMILATIVE CAPACITY	
		CURRENT ADWF 0.350 MGD	PROPOSED PROJECT ADWF 0.875 MGD	INCREMENTAL CHANGE	AVAILABLE PRE-PROJECT [kg/day]	USED BY PROJECT [%]
GENERAL MINERALS						
Total dissolved solids	100%	302	755	453	3,625	12.5%
PRIORITY POLLUTANTS						
Total mercury	86%	1.19E-6	2.98E-6	1.79E-6	4.90E-4	0.4%
Selenium	0%	4.1E-3	1.0E-2	6.16E-3	1.46E-2	42% (1)
Beta Hexachlorocyclohexane (BHC)	0%	3.31E-6	8.27E-6	4.96E-6	0	(2)
Endrin Aldehyde	13%	1.85E-5	4.63E-5	2.78E-5	0	(2)

NOTES

The receiving water flow rate is assumed to be equal to the estimated harmonic mean flow rate during the discharge season (1,300 gpm for the period January-December).

(1) Selenium was never measured to be present in any sample (total of ten samples of effluent and receiving water) above the RL of 5 ug/L.

(2) The Basin Plan establishes the assimilative capacity for persistent chlorinated hydrocarbons at zero.

Total dissolved solids were detected above the RL and quantified in 100% of receiving water samples and 100% of effluent samples. The proposed Project would increase the theoretical discharge of TDS by 453 kg/day, which represents an estimated 12.5% of the current available mass assimilation capacity of 3,625 kg/day.

Total mercury was detected above the RL and quantified in 100% of receiving water samples and 86% of effluent samples. The proposed Project would increase the theoretical discharge of total mercury by 1.8 milligram per day, which represents an estimated 0.4% of the current available mass assimilation capacity of 0.5 gram per day.

Selenium was never measured to be present in any sample (total of ten samples of effluent and receiving water) above the RL of 5 ug/L; the calculation of mass assimilation capacity utilization was performed in response to the reporting of estimated concentrations (below the 5 ug/L WQC) for two out of five receiving water samples and three out of five effluent samples. There is no firm evidence to suggest that selenium has ever been, or is likely to be, discharged by the TVWWTP.

Beta hexachlorocylclohexane (Beta-BHC) was never measured to be present in any sample (total of eleven samples of effluent and receiving water) above the RL of 0.005 ug/L; the calculation of mass assimilation capacity utilization was performed in response to the reporting of a single estimated concentration of 0.12 ug/L in the receiving water sample collected 11 December 2006. The lab reported that the RPD for this compound on this analysis event exceeded the 40% standard between the quantation and confirmation columns; the higher of the two readings was reported as the estimated concentration. There is no firm evidence to suggest that Beta-BHC has ever been, or is likely to be, discharged by the TVWWTP.

Endrin aldehyde was measured in a single sample of WWTP effluent (11 December 2006) at a concentration of 0.077 ug/L. All five receiving water samples and five other WWTP effluent samples were reported Non-Detect at RLs of 0.010 ug/L (nine samples) or 2.0 ug/L (one sample). For reasons presented in Section 6.3.4 below, Endrin aldehyde is not believed to be a likely constituent in current or future discharges from the TVWWTP.

Constituents with potential to bio-accumulate in an aquatic environment were assumed to be present in the effluent at a concentration equal to the average of all sampling events. For non-detect results, the constituent was assumed to be present in the effluent at one-half of the laboratory Reporting Level. This methodology is the reason why selenium, which was never detected in the WWTP effluent above the RL, shows up as a noticeable, but less than significant, increase in mass discharge in Table 6-7. There is no documented reason to expect any detectable increase in selenium in the receiving water attributable to an increase in the TVWWTP discharge rate.

6.3.3 Discussion - Constituents Detected in Over 20% of Effluent Samples

Constituents detected in more than 20% of samples included conventional physical water parameters and a short list of priority constituents from the Region Five 13267 List. Each is discussed in this Section.

6.3.3.1 Ammonia

The current NPDES permit includes effluent limitations for total ammonia. The current chronic criterion (CCC) is 0.42 mg N/L as the 30-day average, and the current acute criterion (CMC) is 3.5 mg N/L as the 1-hour average. Prior to the adoption of the current NPDES permit in March 2005, the WWTP experienced four excursions related to ammonia. The ammonia excursions were eliminated by adjusting operating procedures related to supernatant pumping from the solids stabilization basins, and by changing janitorial cleaning supplies used at the Casino. The operational record of the TVWWTP with respect to total ammonia since adoption of the current NPDES permit in March 2005 is summarized in **Table 6-8** below. Since the adoption of the current NPDES Permit, there have been no ammonia excursions at the WWTP.

Table 6-8 Effluent Total Ammonia Summary Statistics

	Effluent Ammonia as N
	[SU]
n	833
Minimum	0.10
Mean	0.11
Median	0.10
Maximum	1.20

NOTES
Data collected 17 March 2005 – 30 June 2007

The current effluent limitations for total ammonia were calculated using methodology published in UPSEPA 822-R-02-047, *National Recommended Water Quality Criteria*. The criteria for ammonia are based on the maximum pH and temperature of the effluent. The maximum effluent pH and temperature values used to calculate the current TVWWTP effluent limitations for total ammonia were 8.25 and 35.9°C respectively. In addition, Orchard Creek in the vicinity of the WWTP outfall was assumed to be salmonid habitat for the purposes of calculating the acute criterion.

During the term of the current Permit, the maximum effluent pH has been 8.3 (see Table 6-10) and the maximum effluent temperature has been 34.4°C. Using methodology published in UPSEPA 822-R-02-047, the CCC (30-day average) criterion is calculated as 0.42 mg N/L (equal to the current chronic criterion).

Biological characterization of Orchard Creek performed in support of the proposed Project indicates that salmonids are not present in Orchard Creek above Ingram Slough. Biological characterization of Orchard Creek is discussed in Section 4.5 of this RWD. Based on a maximum pH of 8.3, a maximum effluent temperature of 34.4°C, and the new information that salmonids are absent from the receiving water, the acute (CMC) total ammonia criterion should be adjusted to 4.7 mg N/L as the 1-hour average in the amended NPDES permit.

6.3.3.2 pH

The Basin Plan includes a receiving water limitation for surface water bodies in the Sacramento River basin prohibiting the ambient pH in receiving waters from falling below 6.5 or rising above 8.5. In addition, for water bodies designated for the warm water aquatic habitat beneficial use, the Basin Plan prohibits the normal ambient pH of the receiving water from changing by more than 0.5 SU. Regional Board staff has clarified this prohibition in the current NPDES permit as prohibiting the 30-day average pH of the receiving water from changing by more than 0.5 pH units. Orchard Creek is a warm water aquatic habitat located within the Sacramento River basin, therefore both receiving water limitations are applicable to the proposed discharge. Summary statistics of pH measurements made in the receiving water of Orchard Creek during the period January 2005 – June 2007 are presented in **Table 6-9** below.

Table 6-9 Receiving Water pH Summary Statistics

	R1 pH	R2 pH	R2 RUNNING 4-WEEK MEAN
	[SU]	[SU]	[SU]
n	128	128	126
Minimum	6.4	6.4	6.8
Mean	7.5	7.5	~
Maximum	8.2	8.2	7.8

NOTES
Data collected January 2005 – June 2007

Table 6-2 indicates that Orchard Creek is not "high quality" with respect to pH, because a single upstream monitoring event (23 April 2007) yielded a pH measurement below 6.5. On 23 April 2007 the pH at R1 was measured to be 6.41. On the same date, the pH at R2 was measured to be 6.43, suggesting that the WWTP discharge served to buffer and partially correct the receiving water excursion observed this date.

As Table 6-9 shows, the four-week running average pH of Orchard Creek downstream from the discharge has not changed by more than 0.5 SU from a median value of 7.3 SU over the period of record, demonstrating compliance with the Basin Plan normal ambient pH standard.

The current NPDES permit includes an effluent limitation prohibiting discharge of effluent with pH below 6.5 or above 8.5. **Table 6-10** below shows summary statistics for WWTP effluent pH.

Table 6-10 Effluent pH Summary Statistics

	Effluent pH [SU]
n	908
Minimum	6.4
Mean	7.2
Median	7.3
Maximum	8.3

NOTES
Data collected January 2005 – June 2007

Out of 908 daily readings of effluent pH, 906 readings (99.8%) were above 6.5 and below 8.5. The recorded effluent pH measurements on April 23 and 25, 2007 were 6.37 and 6.38 respectively.

The new discharge permit is expected to impose the same effluent limitations and receiving water limitations for pH. The incremental increase in discharge will not result in a lowering of water quality with respect to pH, because the WWTP effluent is expected to continue to remain consistently within the Basin Plan surface water pH target range of 6.5 to 8.5 SU.

6.3.3.3 Temperature

The Basin Plan includes a receiving water limitation prohibiting a discharge from increasing the temperature of an intra-state receiving water body by more than five degrees Fahrenheit.

Table 6-11 shows summary statistics for weekly measurements of receiving water temperature for the period of record, including temperature measured upstream from the discharge outfall (R1), and downstream from the outfall (R2). The temperature difference between the two monitoring points on each sampling date is summarized in the third data column. The maximum temperature gain from R1 to R2 over the period of record was 2 °F; the maximum temperature loss from R1 to R2 was 1.2 °F .

Table 6-11 Receiving Water Temperature Summary Statistics

	R1	R2	R2 –R1 (1)
	TEMPERATURE	TEMPERATURE	TEMPERATURE CHANGE
	[°F]	[°F]	[°F]
n	129	129	129
Minimum	36.2	35.8	-1.2
Mean	60.5	60.3	0.2
Maximum	86.0	86.0	2.0

NOTES
Data collected January 2005 – June 2007
(1) A negative value in this column indicates that the stream temperature downstream from the outfall was less than the stream temperature upstream from the outfall.

While it is possible that the downstream temperature change could vary from recent trends after the proposed increase in the WWTP discharge rate is implemented, it is not clear what, if any, effect such a change might have on downstream aquatic life beneficial uses. In addition, a study of potential for thermal impacts to Orchard Creek has found that any temperature impacts of the TVWWTP discharge on the temperature of Orchard Creek downstream from the outfall will be completely attenuated by the effects of ambient air temperature within the reach upstream from Ingram Slough (See Section 4.5 above). Because new stream biology information indicates the closest cold water fishery is downstream from Ingram Slough, the temperature impacts of the proposed Project would be insignificant (AES, November 2007 draft).

The standard regulating the stream temperature between R1 and R2 does not address conditions downstream from R2, which is where any possible impacts would occur. Sufficient data are not available to assess downstream conditions, existing aquatic populations, or temperature requirements to maintain existing beneficial uses. In addition, the current 5-degree Basin Plan standard is not well-supported by the current body of scientific knowledge concerning protection of aquatic life; USEPA recommends using the maximum of the 7-day average of daily maximums as the monitored criterion (7DADM) in lieu of an arbitrary 5-degree window, and recommends specific 7DADM values for various species. While acknowledging incomplete characterization of the potentially impacted downstream reach of Orchard Creek, and questions about the apparent conflicts between federal and State guidance on assessing thermal impacts in surface waters, the consistently minor fluctuations between temperature at R1 and R2 which were recorded during the period of record indicate that no adverse impacts from thermal effects are likely to arise from the proposed Project.

6.3.3.4 Receiving Water Turbidity

The Basin Plan includes receiving water limitations for turbidity. If turbidity at R1 is less than 5 NTU, then the maximum permitted increase in turbidity between R1 and R2 is 1.0 NTU. If the turbidity at R1 is greater than 5 NTU but less than 50 NTU, then the maximum permitted increase is 20 percent of baseline. **Table 6-12** shows summary statistics on receiving water turbidity.

Table 6-12 Receiving Water Turbidity Summary Statistics

	R1	R2	RECEIVING WATER TURBIDITY EXCURSIONS (1)
	[NTU]	[NTU]	[count]
n	128	128	6
Minimum	0.4	1.0	~
Mean	10.0	10.3	~
Maximum	56.0	150.0	~

NOTES:
Data collected January 2005 – June 2007
(1) See Table 6-13 for detail

Additional details regarding the six receiving water turbidity excursions listed above (which represent less than five percent of all receiving water turbidity sampling events) are included in **Table 6-13** below.

Table 6-13 Receiving Water Turbidity Summary Statistics - Detail

	R1	R1 to R2	R1 to R2
	TURBIDITY	PERMITTED INCREASE	ACTUAL INCREASE
	[NTU]	[NTU]	[NTU]
2005 APR 05	9.0	1.8	2.0
2006 JUN 13	22	4.4	128
2006 JULY 11	47	9.4	73
2007 JAN 09	0.4	1.0	1.1
2007 JUN 05	16	3.2	5.0
2007 JUN 19	7.6	1.5	2.4

NOTES
Data collected January 2005 – June 2007

The TVWWTP is a membrane facility which has not produced a daily average effluent turbidity reading greater than 0.4 NTU over the entire period of record. In addition, the maximum instantaneous effluent turbidity recorded during the period of record (see table 3-7) was equal to, or less than, the average of all instantaneous receiving water turbidity measurements recorded at both R1 and R2 during the period of record (Table 6-12). Turbidity and suspended solids are dependably managed by the treatment technology employed at TVWWTP. Expanding the WWTP discharge is not expected to add suspended solids or turbidity to the receiving water to the extent that downstream beneficial uses could be effected, because the expansion will utilize the same treatment technology as the exiting WWTP.

6.3.3.5 Copper

The effluent maximum and average effluent copper concentrations of 16 and 10.6 ug/L respectively exceeded default CTR-based WQCs of 7.6 ug/L (acute) and 5.3 ug/L (chronic), expressed as total recoverable metal. These WQCs were calculated using CTR methodology, a water hardness of 52 mg/L as $CaCO_3$ (the lowest receiving water hardness reported in this Report) and a WER of 1.0. The average copper concentration in Orchard Creek over the same reporting period was 2.0 ug/L.

Because the maximum effluent concentration exceeded the criterion, this ADA used average values to assess assimilative capacity use. Effluent concentrations over the criterion would be prevented by WQBELs, absent the development of a higher, site-specific criterion for copper. Under these assumptions, the incremental change in downstream copper concentration expected from the proposed Project was calculated to be an increase of 2.7 ug/L (Table 6-5).

It is known that bio-availability and aquatic toxicity of metals are frequently over-estimated by current assessment methods (Federal register, 18 May 2000, p. 31690-1). Based on recent copper toxicity studies in similar nearby streams, it is believed that the currently imposed CTR water quality criterion for copper, and the resulting copper WQBELs in the NPDES permit, are based on unrealistically high estimates of aquatic toxicity for copper. The copper in the TVWWTP effluent is not expected to be available in a biologically available form, and a Water-Effects Ratio Study (WER Study) confirming this impression, and to quantify the toxicity-mitigating effects of the waters of Orchard Creek, has been completed. The WER Study is discussed in Section 7.0 of this RWD. The WER developed through the Study is considerably larger than 1.0, and will lead to considerably higher site-specific water quality criteria for copper, compared to criteria calculated using USEPA default values. Because the copper MEC is less than the CTR copper criteria adjusted for the site-specific WER, the Project does not demonstrate Reasonable Potential for copper, and effluent limitations for copper should not be required for the TVWWTP, after the site-specific WER has been reviewed and adopted by RWQCB. The site-adjusted water quality objective for copper will be fully protective of beneficial uses.

6.3.3.6 Total Dissolved Solids (TDS) and Electrical Conductance (EC)

The projected increase in Electrical Conductance downstream from the outfall was calculated to be 7% (Table 6-5). The chemical characteristic most closely measured by EC is total dissolved solids. The incremental use of available assimilative capacity for TDS was projected to increase by 6% in the concentration-based analysis (Table 6-6) and by 12.5% in the mass-based analysis (Table 6-7). The mass-based analysis used an estimate of the harmonic mean flow in Orchard Creek which was based on incomplete data, and which may have been lower than the true value. Underestimating the harmonic mean flow in the receiving water body will lead to an over-estimation of the use of available assimilative capacity.

The concentration of TDS in Orchard Creek downstream from the WWTP outfall was projected to increase from 125 mg/L to 145 mg/L in the concentration-based analysis (Table 6-6). The applicable agriculture-based WQC is 450 mg/L (Ayers and Wescott, 1985), and the applicable human-health based WQC is 500 mg/L (DHS secondary recommended MCL). Beneficial uses of the receiving water will be fully protected at the projected concentration, and over 90% of existing assimilative capacity will remain available.

6.3.3.7 Zinc

The effluent maximum and average effluent zinc concentrations were 89 ug/L and 51.9 ug/L respectively. The CTR-based WQC (calculated using a hardness of 52 mg/L as $CaCO_3$ and a WER of 1.0) is 69 ug/L for both the chronic and acute criteria, expressed as total recoverable metal. The average zinc concentration in Orchard Creek over the same reporting period was estimated to be 5.3 ug/L, and the maximum estimated receiving water zinc concentration was 7.4 ug/L.

The increase in the discharge was projected to use 20% of existing assimilative capacity for zinc in the concentration-based mixing model.

Zinc discharge reduction is discussed in **Section 6.4, Best practicable Treatment.**

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For all other constituents detected in more than 20% of samples, and not addressed in Section 6.2.3 above, the downstream changes in constituent concentrations expected from the proposed Project would be insignificant. The proposed increased discharge would still be protective of beneficial uses, and would preserve a substantial amount (over 90%) of calculated assimilative capacity.
~~~

6.3.4 Discussion - Constituents Detected in 20% or Less of Effluent Samples

Constituents for which more than 80% of the effluent population was ND, and for which no confirmable measurement of concentration above the RL was reported, were determined to have no potential to degrade water quality, because the constituent appears too infrequently in the water to create a significant and likely effect on a long term, chronic water quality condition.

Thallium and **cadmium** were each reported as present but below the Reporting Level in one out of seven samples in the WWTP effluent data set. **Chloroform** was reported as present but below the Reporting Level in two out of eight WWTP effluent samples. In each of these four cases, the laboratory reported an estimated concentration below the Reporting Limit. The estimated concentrations are listed in Appendix A.

Endrin Aldehyde (CTR #116) was measured to be present in the WWTP effluent at a concentration of 0.077 ug/L in one out of eight samples. This compound is an impurity and breakdown product of the pesticide Endrin. Endrin is a persistent chlorinated hydrocarbon insecticide that has not been produced or sold for general use in the United States since 1986. The casino and WWTP did not exist prior to 2003. The detection is likely the result of legacy deposits that pre-date the casino and WWTP. Source water samples were not collected for this event, so it is not known if the constituent was also present that day in the source water (surface water from PCWA).

Beta Hexachlorocyclohexane (Beta-BHC) (CTR #104) was reported as present in one out of seven samples collected from Orchard Creek, but the Relative Percent Difference between quantation and confirmation columns exceeded 40%. The reported quantation was the higher of the quantation and confirmation columns. Beta-BHC is a breakdown product of Lindane (Gamma BHC), another persistent chlorinated hydrocarbon pesticide. Lindane is still used widely, in pet shampoos, as a grain fumigant, as a wood preservative, and as an insecticide labeled on livestock, fruits and vegetables, cotton, wool, tobacco, plants, and trees. Beta-BHC was not detected or estimated in any of eight WWTP effluent samples analyzed.

Coliform. Prior to the term of the current NPDES Permit, three clusters of excursions beyond the NPDES Permit effluent limitations for total coliforms were noted. The first cluster began on 16 August 2004, and the third and final cluster of excursions ended on 05 January 2005. The cause of the coliform issues was found to be a structural defect in the Zenon membrane cartridge support structures that allowed small amounts of mixed liquor to bypass the membranes. The apparent duration of each cluster of excursions was exacerbated by long laboratory turnaround times, averaging 12 days.

The Discharger's response to the issue included:

- Replacement of damaged membrane support members;
- Replacement of a single-bulb pulsed UV system with a new 4-bulb continuous UV system;
- Replacement of the chlorine analyzer equipment with new upgraded equipment and associated training;
- Purchase of an in-house absence-or-presence testing coliform incubator for use at the WWTP, providing results in less than 24 hours;
- Improved communications protocol between the TVWWTP and the analytical lab providing coliform lab testing. Presumptive lab results, if positive, are now communicated by the lab to WWTP personnel as soon as the presumption is made.

Since the adjustments listed above were implemented, there have been only two single-day effluent coliform excursions while operating under the current NPDES Permit: 03 August 2005 (350 MPN/100 mL) and 12 October 2005 (50 MPN/100mL).

6.4 Best Practicable Treatment or Control

The use of best practicable treatment is required for surface water discharges by Resolution 68-16, as follows:

> "Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the ***best practicable treatment*** or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."

Best practicable treatment (BPT) is defined in terms of effluent quality and water quality goals, not in terms of treatment technology. BPT is defined in 40CFR§35.2005 as a treatment technology capable of achieving any one of four regulatory standards:

> "The cost-effective technology that can treat wastewater, combined sewer overflows and non-excessive infiltration and inflow in publicly owned or individual wastewater treatment works, to meet the applicable provisions of: (i) 40 CFR part 133--secondary treatment of wastewater; (ii) 40 CFR part 125, subpart G--marine discharge waivers; (iii) 40 CFR 122.44(d)--more stringent water quality standards and State standards; ***or*** (iv) 41 FR 6190 (February 11, 1976) - Alternative Waste Management Techniques for Best Practicable

Waste Treatment (treatment and discharge, land application techniques and utilization practices, and reuse)."

40 CFR §133.102 includes the performance standards defining secondary treatment of wastewater:

§ 133.102 Secondary treatment.
The following paragraphs describe the minimum level of effluent quality attainable by secondary treatment in terms of the parameters—BOD5, SS and pH. All requirements for each parameter shall be achieved except as provided for in §§ 133.103 and 133.105.

(a) BOD5.
(1) The 30-day average shall not exceed 30 mg/l.
(2) The 7-day average shall not exceed 45 mg/l.
(3) The 30-day average percent removal shall not be less than 85 percent.
(4) At the option of the NPDES permitting authority, in lieu of the parameter BOD5 and the levels of the effluent quality specified in paragraphs (a)(1), (a)(2) and (a)(3), the parameter CBOD5 may be substituted with the following levels of the CBOD5 effluent quality provided:
(i) The 30-day average shall not exceed 25 mg/l.
(ii) The 7-day average shall not exceed 40 mg/l.
(iii) The 30-day average percent removal shall not be less than 85 percent.

(b) SS.
(1) The 30-day average shall not exceed 30 mg/l.
(2) The 7-day average shall not exceed 45 mg/l.
(3) The 30-day average percent removal shall not be less than 85 percent.

(c) pH.
The effluent values for pH shall be maintained within the limits of 6.0 to 9.0 unless the publicly owned treatment works demonstrates that:
(1) Inorganic chemicals are not added to the waste stream as part of the treatment process; and
(2) contributions from industrial sources do not cause the pH of the effluent to be less than 6.0 or greater than 9.0.

The proposed project will exceed the CWA minimum treatment requirements, and will produce disinfected tertiary recycled water as defined under Title 22 Section 60301.23. The expanded TVWWTP will employ an activated sludge process combined with membrane filtration (immersed membrane bioreactor) to accomplish the primary and secondary treatment required of all POTWs by CWA Section 301. In addition, the process basins and operational protocol will accommodate biological nitrogen removal during the primary/secondary process. All water will be membrane-filtered and UV-disinfected.

The TVWWTP has demonstrated capability of meeting the standards enumerated above, and the expanded facility proposed for this Project will employ the same technologies. On-site re-use of treated wastewater for irrigation of landscape plants will be maximized. All available land-based options for re-use and disposal of treated wastewater have been explored and implemented to the fullest extend practical. Discharge of treated wastewater to surface water has been minimized to the greatest extend practical. Continued compliance with all applicable permit conditions is expected. The design and operation of the proposed Project is fully consistent with the Resolution 68-16 requirement to implement BPT.

6.5 Social and Economic Cost/Benefit Statement

Section 6.5.1 states the scope of the public interest balancing statement. Section 6.5.2 identifies project alternatives and the reasons why they were found to be infeasible. Section 6.5.3 lists the benefits of the proposed Project.

6.5.1 Scope

The socio-economic analysis addresses the expected costs and benefits associated with the proposed increased discharge of water quality constituents shown in this ADA to be expected to take more than 10% of existing assimilative capacity. The socio-economic analysis does not address constituents for which the receiving water existing condition provides no additional assimilative capacity, nor constituents which are projected to utilize 10% or less of exiting assimilative capacity.

Constituents projected to utilize more than 10% of existing assimilative capacity on a mass-based basis include selenium and total dissolved solids.

The calculated use of assimilative capacity for selenium is a questionable result of standard data assessment techniques; although selenium was never detected in any sample (effluent or receiving water) above the Lab Reporting Limit of 5 ug/L, the use of estimated concentrations and the interpretation of ND results as equal to one-half the Reporting Limit led to the questionable result. Because selenium was never detected in any sample (effluent or receiving water) above the lowest applicable WQC of 5 ug/L, this ADA does not address balancing public interest with the discharge of selenium.

TDS was projected to increase by 12.5% in the mass-based analysis (Table 6-7), but by only 6% in the concentration-based analysis (Table 6-6). Electrical Conductance is sometimes used as a surrogate for TDS in water quality assessment, and the projected increase in Electrical Conductance downstream from the outfall was calculated to be only 7% (Table 6-5). The concentration-based assessments of dissolved salts do not indicate a significant use of assimilative capacity. The mass-based assessment used an estimate of the harmonic mean flow in Orchard Creek which was based on incomplete data, and which may have been lower than the true value. Underestimating the harmonic mean flow in the receiving water body will lead to an over-estimation of the use of available assimilative capacity. Projected concentrations of TDS downstream from the TVWWTP outfall were calculated to be well below the applicable agriculture-based WQC of 450 mg/L. The concentration-based assessments were based on an assumed low flow condition of (600 gpm) and are felt to be the most dependable estimate in the analysis. Beneficial uses of the receiving water will be fully protected at the projected concentration, and this ADA does not address balancing public interest with the discharge of TDS.

The only constituent projected to utilize more than 10% of existing assimilative capacity on a concentration-based basis is zinc. The objective of this social and economic cost/benefit statement is to determine if lowering the quality of Orchard Creek with respect to zinc is in the "best interests" of the people of the State.

6.5.2 Potential Alternatives to Increased Discharge

Alternatives to the proposed increase in discharge to Orchard Creek were considered. Each was assessed for cost and feasibility. It should be noted that alternatives based on treatment at an alternate NPDES-permitted facility would not likely decrease the discharge of zinc to the waters of the State, but merely change the location of the discharge to a different stream. Summary details about the alternatives follow. Detailed analyses of project alternatives are presented in *Thunder Valley WWTP Expansion Water/Wastewater Feasibility Study* (HSe, 2007):

1. City of Lincoln wastewater system connection – Pumping and transmission facilities required to convey 100% of the wastewater generated by the expanded casino and hotel facilities to the City of Lincoln wastewater collection and treatment facilities would be constructed. The expanded WWTP would not be constructed. The existing WWTP would be decommissioned and effluent flow to Orchard Creek at this outfall location would cease.

2. Placer County wastewater system connection – Pumping and transmission facilities required to convey 100% of the wastewater generated by the expanded casino and hotel facilities to the South Placer Wastewater Authority (SPWA) wastewater collection facilities, for ultimate treatment at the City of Roseville's Pleasant Grove WWTP, would be constructed. The expanded WWTP would not be constructed. The existing WWTP would be decommissioned and effluent flow to Orchard Creek at this outfall location would cease.

3. Onsite treatment / disposal to spray fields – The expanded WWTP would be constructed, and spray fields would be used for disposal of the treated effluent. Water would be applied to the spray fields at agronomic rates throughout the year.

Tailwater and runoff would be captured and returned to the disposal area. Seasonal storage would be required.

4. Onsite treatment / disposal to leach fields – The expanded WWTP would be constructed, and conventional leach fields would be used for disposal of the treated effluent.

The detailed analysis of the alternatives listed above (see HSe, 2007) did not find that treatment at alternative facilities was available within the required time frame. The detailed analysis found that land disposal was not feasible because of local land use patterns and restrictions, widespread occurrence of vernal pools over the potential disposal sites, and unsuitable soils.

6.5.3 Benefits of Increased Discharge

The proposed Project will bring important economic and social development to the local area of the Project.

Local employment:

- The hotel will create over 1,200 new jobs, bringing the casino's total to over 3,200 (including part time employees)
- Over 1,000 jobs will be required for the construction of the project

Increase in taxes and fees paid to local agencies:

- Property Taxes: Thunder Valley currently pays Placer County $2,715,292 annually for revenues in lieu of secured property taxes for trust lands. Once the expansion is completed, Thunder Valley Casino will pay an additional $8,000,000 annually; bringing the total annual payment to approximately $10.7 million.

- Fire/Safety: Thunder Valley Casino currently pays Placer County approximately $1.1 million dollars annually for fire protection services and $1 million to the Placer County Sheriff for safety and protective services.

- Food & Beverage Sales Tax: Thunder Valley Casino currently pays Placer County approximately $550,000 a year in food and beverage taxes. Once the expansion is complete, Thunder Valley Casino will pay an additional $400,000 a year in food and beverage taxes, totaling approximately $1 million annually.

- Occupancy Tax: Thunder Valley Casino will pay Placer County approximately $1.4 million annually in room occupancy tax. As well, Placer County Tourism will receive approximately $200,000 annually from a $1 a night hotel occupancy tax.

- Thunder Valley Casino currently pays the State of California $33.8 million a year for transportation improvements and $2 million annually to the State Revenue Sharing Trust Fund for non-gaming tribes.

Support/patronage of local support businesses:

- Thunder Valley Casino spends approximately $45 million with vendors in the area and is projected to spend an additional $25 million once the expansion has been completed.

Local community social and cultural resources:

- The local community will have 30,000 square feet of additional ballroom space to host events with room for up to 2,000 people
- Performing Arts Center will bring to the local region expanded cultural offerings including music, comedy and theater
- The additional restaurants, entertainment areas, and spa areas will give local residents additional local cultural opportunities (*ref*, AES, 2007, Draft TEIR)

6.6 Anti-Degradation Analysis Findings

The proposed Project will lead directly to important economic and social development in the local region.

Under the flow conditions examined in the ADA, the proposed Project will lead directly to a decrease in the downstream concentration of aluminum, arsenic, barium, boron, iron, manganese, mercury, nickel, nitrite and sulfite. By lowering in-stream concentrations of these ten parameters, the Project will increase the available assimilative capacity of Orchard Creek for the ten constituents.

The economic and social benefits which the proposed Project can provide require incremental lowering of the quality of Orchard Creek with respect to zinc, which cannot be attenuated by reasonable means.

The incremental lowering of the quality of Orchard Creek with respect to zinc would not be the result of the use of less than best practical treatment technologies or inadequate operating staff procedures.

The incremental lowering of the quality of Orchard Creek with respect to zinc would not unreasonably affect downstream present and anticipated beneficial uses, and would not result in water quality less than that prescribed by water quality objectives.

The projected changes in the quality of Orchard Creek with respect to zinc would be fully consistent with federal and State anti-degradation policies.

The balance of benefits and projected changes in the quality of Orchard Creek with respect to zinc would create the maximum benefit for the people of the State.